THE HOUSEHOLD PRODUCTION THEORY OF CONSUMPTION: AGGREGATE IMPLICATIONS AND TESTS

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College of Commerce and Business Administration
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FACULTY WORKING PAPERS

College of Commerce and Business Administration

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October 12, 1979

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Summary:

This paper first provides long-run estimates of the consumption function based upon the entire post-war period and short-run estimates over each of the five business cycles which challenge the conventional wisdom that short-run MPCs are less than the long-run MPC out of disposable income. The paper then explores aggregate implications of the microeconomic theory of household production and compares them with alternative theories of the consumption function including the life cycle and permanent income hypotheses. It is shown that one way to distinguish the various hypotheses is to examine the MPCs out of labor and nonlabor income in the short-run and long-run. These tests are performed and found to favor the household production hypothesis over the alternatives.

The Household Production Theory of Consumption: Aggregate Implications and Tests

I. Introduction

This paper has essentially two purposes. The first is to offer some surprising findings that are at odds with conventional theories of consumption. The second is to explore some aggregate implications of the relatively new microeconomic theory of household production.

In recent papers Drazen, Hall, and White all express concern with one or more aspects of received theories of consumption, particularly the Permanent Income Hypothesis (PIH) and Life Cycle Hypothesis (LCH). Drazen is puzzled by the secular constancy of the saving rate in the face of major demographic changes. Hall concludes that post-war evidence supports only a "modified" version of the PIH and LCH. White uses simulation analysis to demonstrate that the LCH can explain no more than 60 percent of observed aggregate saving.

In Section II of this paper we find the PIH and LCH lacking on another front. Both theories predict that the marginal propensity to consume (MPC) out of short-run variations in measured income will be less than the MPC out of long-run income. If short-run is defined as a single business cycle, and long-run as the entire post-war period, then this relation has failed to hold true in at least two of the five completed cycles.

The other purpose of this paper is to explore on a macro-level the implications of the micro-level theory known as household production. Briefly, this theory says that the demand for market goods is essentially a derived demand for an input in the production of more basic commodities

produced with time and goods in the household. This theory has profitably been applied to a variety of microeconomic concerns including the demand for education, health, transportation, children, and recreation. However, aggregate implications of this theory have largely been ignored or unexplored. According to one recent survey of consumption on an aggregate level, "the practical value of this approach, however, still has to be determined."[1]

There are at least two reasons for investigating the macroeconomic implications of household production theory. One is simply that it may improve our understanding and projections of aggregate spending. This may prove to be rather timely in light of growing concern with conventional theories. A second reason is that testing household production theory with aggregate data may strengthen the theory's micro-foundations, just as the LCH, itself developed in a microeconomic context, found early support from macro data.

The plan of the paper is as follows. Section II estimates short-run and long-run consumption functions with post-war quarterly data and examines the stability of the MPC out of disposable income. Section III derives some aggregate implications of the theory of household production and compares them with the PIH and LCH. It is shown that one way to distinguish among the theories is to examine the short-run and long-run MPCs out of labor and nonlabor income. Section IV performs these tests.

II. Estimating Consumption Functions with Short-Run and Long-Run Data.

Nearly every intermediate textbook in Macroeconomics begins its chapter on the consumption function with the assertion that estimates of

the marginal propensity to consume based upon a "short-run" time series are invariably smaller than those based upon a "long-run" time series. But exactly what is meant by "short-run" and "long-run" is rarely precisely stated. In this section we show that if "short-run" is defined as one complete business cycle (measured from peak to peak) and "long-run" is defined as the entire post-war period, than these data provide very limited support of the textbook orthodoxy.

Estimates of the consumption function in the 1940's based upon cross-sectional data or the then newly available national income statistics badly underpredicted actual post-war consumption spending. Kuznet's re-estimates of consumption with annual time-series observations found a significantly higher MPC. Both Friedman's and Modigliani's work in the 1950's were motivated by attempts to explain "what went wrong" with the earlier estimates. Friedman's PIH and Modigliani's LCH advance theoretical explanations why short-run time-series and cross-sectional estimates of the MPC should be smaller than long-run time-series estimates. These hypotheses are well-known by this time and need not be reviewed here in any detail.

Many subsequent estimates of consumption functions have been offered which purport to "test" the PIH or LCH. It is important to distinguish valid from invalid tests of these hypotheses. Estimates that find short-run MPCs smaller than long-run MPCs are certainly consistent with the PIH and LCH, but cannot themselves be considered tests since the hypotheses were originally proposed to be consistent with this finding. On the other hand, if it is found that short-run MPCs are <u>not</u> consistently less than long-run MPCs, then this would be evidence against the PIH and LCH.

Another problem with much past empirical work on the consumption function is that conventional tests can rarely separate or distinguish the PIH from the LCH. This may imply that the two hypotheses are mutually consistent, but it may just mean that the tests themselves are incomplete or poorly implemented.[2] In most empirical work both permanent and lifetime income are measured as distributed lags on past income. This procedure not only makes it impossible to distinguish the two hypotheses from each other, but also makes it impossible to distinguish them from a Keynesian consumption function with an expenditure lag. In Section IV we shall look for tests that can distinguish the household production model from the alternative hypotheses.

Figure 1 sketches the pattern of post-war business cycles as defined by the NBER. Turning points are identified by quarter and year. Since 1948 there have been five and one-half complete cycles, the longest lasting over nine years in the 1960's, the shortest just under three years in the late 1950's.

The "long-run" consumption functions estimated below are based upon quarterly data for the entire five and one-half business cycles of 105 quarters. Five "short-run" consumption functions are estimated—one for each complete cycle, measured peak to peak. Short-run estimates were nearly identical when the cycles were measured trough to trough or midpoint to midpoint, so only the peak to peak results are reported here.

The basic form of the consumption function estimated is the simple Keynesian structure with a one-quarter lag on income:

$$C_t = a + b\, Y'_{t-1} \qquad (1)$$

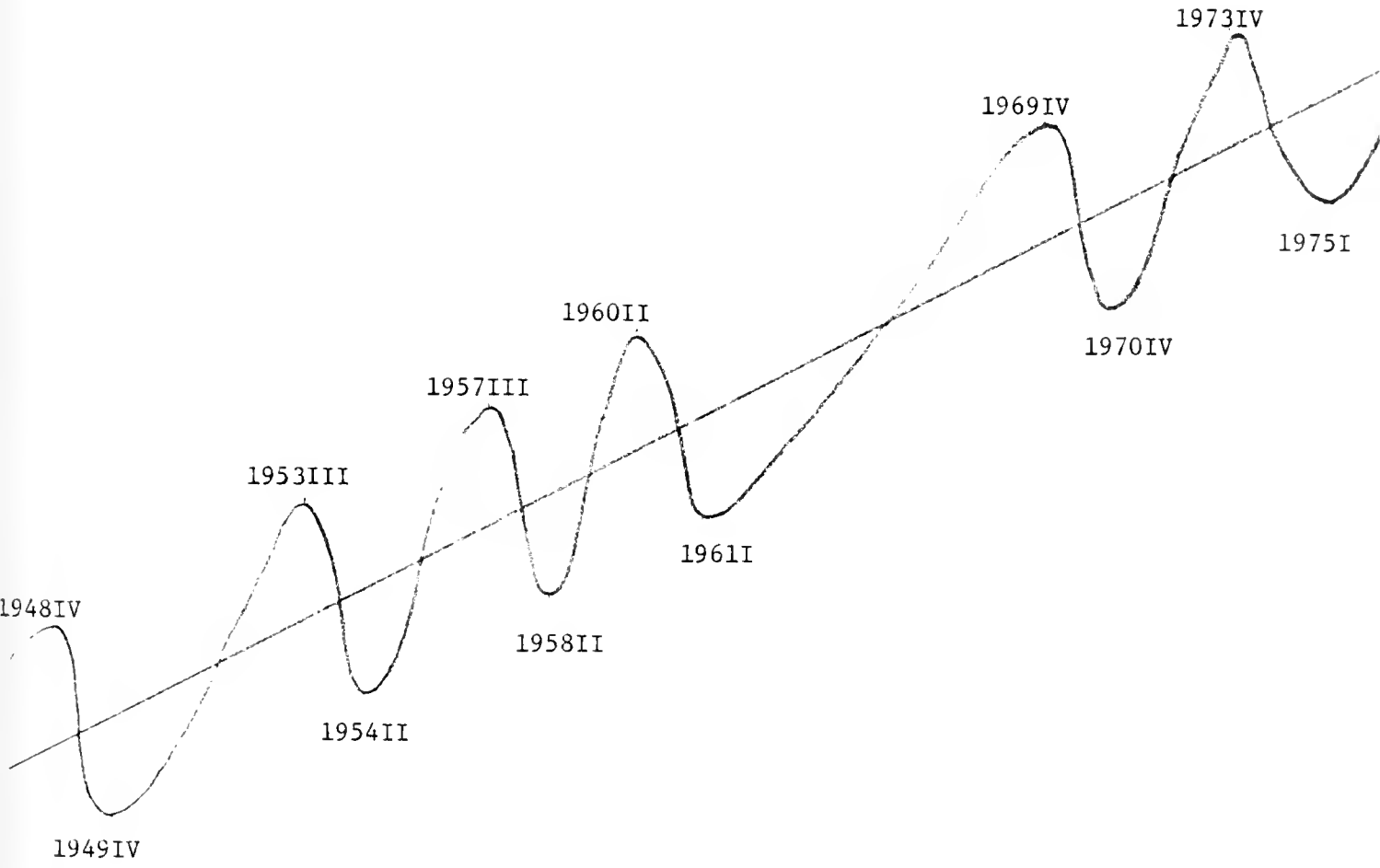

Figure 1

Post-war Business Cycles

As noted above, (1) is often taken to be consistent with both the PIH and LCH. Y'_{t-1} is quarterly disposable personal income deflated by the implicit P.C.E. deflator. C_t is measured either as constant 1972 dollar quarterly personal consumption expenditures excluding purchases of durable goods (as in Table 1) or including purchases of durables (as in Table 2). Of course neither measure corresponds to the theoretical notion of consumption as purchases of nondurables and services and the imputed rental value of the stock of durable goods. These are, however, the two measures widely used by others in tests of the LCH and PIH.

Long-run estimates of equation (1) are reported in Tables 1 and 2 for the two measures of consumption. Both initial estimates suffered from severe autocorrelation, so the results reported here have been "rho-differenced" according to a two-step Cochran-Orcutt procedure. The appropriate rho-value is reported, along with the adjusted R^2. Standard errors appear in parentheses.

Estimates of the consumption function for each of the five business cycles were obtained using a technique of dummy variables. Equation (1) was re-estimated with the complete data five separate times in the form

$$C_t = a + a'd + bY'_{t-1} + b'dY'_{t-1} \qquad (2)$$

where d takes the value 1 over the quarters of the particular business cycle and 0 outside the years of the cycle. The short-run intercepts reported in the tables are obtained as $a + a'$ and the short-run MPCs as $b + b'$. If b' is significantly different from zero according to a simple T-test, then the short-run MPC is significantly different from the long-run MPC. The conventional wisdom is that a' should be significantly positive and b' significantly negative.[3]

Table 1

Personal Consumption Expenditures Excluding Durable Goods

$$C_t = a + b\ Y'_{t-1}$$

Period (Number of Quarters)	a	b	$\bar{R}^2$	RHO	DW
Long-run					
1948IV - 1975I	55.01	.705	.96	.84	1.90
(105)	(8.80)	(.015)			
Short-run					
1949II - 1953II	182.0**	.344**	.97	.81	1.81
(17)	(50.09)	(.132)			
1953III - 1957II	122.11	.530	.97	.82	1.89
(16)	(83.95)	(.191)			
1957III - 1960I	252.82*	.298*	.96	.83	1.84
(11)	(125.07)	(.262)			
1960II - 1969III	70.13**	.691	.99	.70	1.80
(38)	(16.48)	(.027)			
1969IV - 1973IV	275.27**	.432**	.98	.78	2.04
(17)	(59.52)	(.073)			

Standard errors appear in parentheses.
* significantly different from the long-run coefficient at the 10% level.
** significantly different from the long-run coefficient at the 5% level.

Table 2

Total Personal Consumption Expenditures

$$C_t = a + b\ Y_{t-1}$$

Period (Number of Quarters)	a	b	$\bar{R}^2$	RHO	DW
Long-run					
1948IV - 1975I (105)	23.83 (6.02)	.880 (.010)	.99	.67	2.01
Short-run					
1949II - 1953II (17)	174.15** (57.21)	.469** (.154)	.99	.66	1.96
1953III - 1957II (16)	72.69 (75.65)	.756 (.177)	.99	.66	2.01
1957III - 1960I (11)	33.69 (144.48)	.866 (.307)	.99	.65	1.97
1960II - 1969III (38)	29.42 (18.41)	.877 (.030)	.99	.62	1.98
1969IV - 1973IV (17)	137.12** (64.93)	.638** (.081)	.99	.67	2.03

Standard errors appear in parentheses.
* significantly different from the long-run coefficient at the 10% level.
** significantly different from the long-run coefficient at the 5% level.

Table 1 provides only limited support for the conventional wisdom. While the intercept of the consumption function is significantly greater in the short-run than the long-run over four of the five business cycles, over only three of the cycles is the short-run MPC significantly less than the long-run MPC. Over the second and fourth business cycles, the MPCs are not significantly different from the long-run estimate. Of course it might be argued that the estimated MPC of the fourth cycle is no less because the cycle itself was so unusually protracted.

When the dependent variable is total consumption expenditures including durables, as in Table 2, the results run even stronger against the conventional wisdom. Comparing the short-run MPCs to the long-run MPC, over three of the five business cycles the MPC is not significantly smaller than the long-run MPC. And over the same three cycles the intercept is insignificantly different from the intercept of the long-run function.

III. Aggregate Implications of the Theory of Household Production

In this section we review the basic microeconomic theory of household production and then explore some of its aggregate implications.

The theory of household production was developed independently by Becker, Muth, and Lancaster in the mid-1960's. The notion is that a household derives utility from basic commodities which are produced by the household itself through the productive activity of combining market-purchased goods and services with the household's own input of time. These basic commodities could be thought of perhaps as the utilitarian's list of basic pains and pleasures or as an inventory of needs

such as shelter, nourishment, good health and the like. While these basic commodities remain unchanged with time, the possible range of market goods that can be used to satisfy these basic needs can expand.

Formally, the household's utility function is written as

$$U = U(Z_1, Z_2, \ldots Z_N) \tag{3}$$

where Z_i stands for a basic commodity service produced within the household according to the production function

$$Z_i = f^i (t_i, X_i) \qquad i = 1, \ldots N \tag{4}$$

In equation (4) t_i represents the fraction of household time devoted to production of Z_i and X_i is a market good (or vector of goods) purchased at price P_i. The utility function (3) is maximized subject to the N production functions in (4) and subject to the "full income" constraint:

$$\sum_{i=1}^{N} P_i X_i + \sum_{i=1}^{N} w t_i = w T + V \tag{5}$$

In (5), V is nonlabor income and T represents total time per period which is just exhausted by the input of time into all types of household production, $\sum_{i=1}^{N} t_i$, and work-time, t_w:

$$\sum_{i=1}^{N} t_i + t_w = T \tag{6}$$

By substituting the time constraint (6) into (5), the income constraint could be rewritten in the more familiar form

$$C = \sum_{i=1}^{N} P_i X_i = w t_w + V = Y + V \tag{7}$$

where Y is called labor income and C is called consumption.[4]

The household selects t_i, t_w, X_i to maximize (3) subject to (4) and (5). The demand for market goods, X_i, and home time, t_i, represent derived demands, analogous to the derived demand by a firm for its inputs.

These demand functions can be written as:

$$t_i = t^i (w, P_i, Z_i^*, \ldots) \qquad i = 1, \ldots N \qquad (8)$$

$$X_i = X^i (P_i, w, Z_i^*, \ldots) \qquad i = 1, \ldots N \qquad (9)$$

That is, each input demand depends upon its own price, the price of the other input, and the level of commodity services.

It is convenient to distinguish two separate effects of the wage rate on the demand for X_i--a substitution and an expenditure effect. Holding Z_i^* constant, an increase in w will increase the demand for X_i as the household attempts to substitute away from the input that has risen in price. This is the substitution effect. Letting Z_i^* vary, an increase in w raises labor income, Y, which increases consumption of all normal Z_i, and therefore raises the demand for all inputs including X_i. This is the expenditure effect. The two effects work in the same direction; that is, they predict a positive correlation between wages and expenditures on market goods. In cross-sectional studies of consumption expenditures, income is frequently regressed on expenditures. The positive association that is nearly always found reflects both the positive expenditure and substitution effect.

It is now possible to discuss some major macroeconomic implications of the theory. First, like all other theories of consumption, the household production hypothesis (HPH) predicts a positive correlation between aggregate income and consumption expenditures. Second, like the PIH and

LCH, the HPH suggests that this correlation will be stronger in the long-run than in the short-run. The reasoning is as follows. The correlation between consumption expenditures and income measured with long-run data reflects both the positive substitution and expenditure effect. In the short-run, however, there is reason to believe that the substitution effect is either nonexistent or at best very weak.

First of all, short-run variations in income (over the business cycle) result primarily from involuntary changes in employment or hours, not fundamental changes in the value of the marginal product of time. And with no change in the value of time, there is no induced substitution of inputs in household production. In the long-run, on the other hand, changes in income result primarily from rising real wages which induce a substitution in household production towards more goods-intensive techniques.

A second reason why the substitution effect is much weaker in the short-run is that even if there are short-run increases in the value of time, substitution in production may be impossible, due to internal or external adjustment costs. Just as a firm may face increasing marginal costs of short-run adjustment, so too it may be argued that the household faces these same costs. These may be internal to the household, such as the burden of rearranging family member's chores and responsibilities, or they may be external to the household, reflecting supply conditions. For example, microwave ovens and fast food restaurants, today important market purchased inputs, were not even available twenty-five years ago. Only in the long-run do some substitution possibilities become available as new market goods open up new production possibilities.

To review, the HPH offers an additional rationale for MPCs derived from short-run data to be smaller than those estimated with long-run data. However, since this is exactly the prediction of existing hypotheses, does the HPH tell us anything new? Furthermore, is it possible to develop any tests that can distinguish the HPH from the PIH or LCH?

To begin, it is important to distinguish between labor income, Y, and nonlabor income V. The relation between C and Y reflects both the expenditure and substitution effects while that between C and V captures only an expenditure effect. This means that the HPH really only predicts a smaller short-run MPC out of Y. There is no reason for the MPC out of V to be any less in the short-run than the long-run. On the other hand, the PIH predicts smaller short-run MPCs out of all types of measured income that have transitory components. To the extent V is even more variable than Y, then its short-run MPC should be less than its long-run MPC by even more than that of Y's.[5] It is less clear what the LCH predicts here. But at any rate, this appears to be a viable test that can separate the PIH from the HPH. This test is performed in Section IV.

IV. Consumption Spending Out of Labor and Nonlabor Income in the Short-Run and in the Long-Run.

To test for differences in the short-run and long-run MPCs out of labor and nonlabor income, it is necessary to divide disposable personal income, Y', into the proper components. Unfortunately, the task is not easy. Consider the following three-way split:

$$Y' \equiv Y + V + T \tag{10}$$

Labor income, Y, is defined as wages and salaries and other labor income. Nonlabor income, V, is defined as proprietor's income, rent, dividends, and interest. T stands for net transfers--transfer payments minus personal contributions for social insurance and personal tax and nontax payments. All variables are expressed in 1972 dollars by deflating by the P.C.E. price index.

There are several problems with these definitions. For one, it is wrong to include all proprietor's income with nonlabor income since a sizable portion of that figure represents the opportunity cost of the sole proprietor. However, we have made no attempt to correct this figure so as to avoid suspicion that the findings are merely an artifact of the imputation. This matter deserves more careful attention in future work.[6]

The other problem concerns T. It would be nice to have been able to divide taxes into labor and nonlabor components so that each income component could have been reported net of taxes. No such division is provided in the national income statistics. Transfers minus taxes was included as a separate variable so that the components would sum to disposable personal income.

Equation (10) is substituted into equation (1) and the following simple specification is estimated:

$$C_t = a + b_1 Y_{t-1} + b_2 V_{t-1} + b_3 T_{t-1} \qquad (11)$$

Long-run estimates of equation (11) based upon the 105 quarterly postwar observations are presented in Table 3 and 4 for the two definitions of consumption. Results have been rho-differenced according to a two-step Cochran-Orcutt procedure to correct for autocorrelation. Standard errors appear in parentheses below the coefficients.

Table 3

Personal Consumption Expenditures Excluding Durable Goods

$$C_t = a + b_1 Y_{t-1} + b_2 V_{t-1} + b_3 T_{t-1}$$

Period (Number of Quarters)	a	b_1	b_2	b_3	$\bar{R}^2$	RHO	DW
Long-run							
1948IV - 1975I	12.59	.798	.171	.314	.97	.83	1.73
(105)	(1.86)	(.047)	(.186)	(.086)			
Short-run							
1949II - 1953II	177.45**	.434**	.080	.130*	.98	.80	1.78
(17)	(44.75)	(.140)	(.349)	(.119)			
1953III - 1957**	91.70	.540	.803	.769	.98	.80	1.75
(16)	(87.93)	(.396)	(.924)	(1.110)			
1957III - 1960I	198.26	.260*	.762	.152	.97	.81	1.61
(11)	(188.09)	(.364)	(1.361)	(1.245)			
1960II - 1969III	87.44	.714	.430	.455	.99	.66	1.61
(38)	(20.29)	(.112)	(.368)	(.223)			
1969IV - 1973IV	193.77**	.569	.242	.043*	.99	.70	1.70
(17)	(55.92)	(.199)	(.509)	(.205)			

Standard errors appear in parentheses.
* significantly different from the long-run coefficient at the 10% level.
** significantly different from the long-run coefficient at the 5% level.

Table 4

Total Personal Consumption Expenditures

$$C_t = a + b_1 Y_{t-1} + b_2 V_{t-1} + b_3 T_{t-1}$$

Period (Number of Quarters)	a	b_1	b_2	b_3	$\bar{R}^2$	RHO	DW
Long-run							
1948IV - 1975I	44.01	.945	.422	.481	.99	.66	1.80
(105)	(12.01)	(.059)	(.241)	(.120)			
Short-run							
1949II - 1953II	205.89**	.490**	.043	.139**	.99	.64	1.86
(17)	(53.33)	(.160)	(.536)	(.184)			
1953III - 1957**	25.19	.931	1.074	2.121	.99	.63	1.85
(16)	(85.41)	(.544)	(1.467)	(1.498)			
1957III - 1960I	-104.9	.727	2.312	1.014	.99	.64	1.75
(11)	(227.26)	(.504)	(2.081)	(1.503)			
1960II - 1969III	50.85	.924	.521	.642	.99	.59	1.74
(38)	(25.71)	(.161)	(.512)	(.325)			
1969IV - 1973IV	-12.08	1.345	-.828	.411	.99	.49	1.72
(17)	(58.97)	(.253)	(.835)	(.256)			

Standard errors appear in parentheses.
* significantly different from the long-run coefficient at the 10% level.
** significantly different from the long-run coefficient at the 5% level.

The long-run estimates are consistent with the earlier estimates in Tables 1 and 2 and with prior beliefs about the relative magnitudes of the different MPCs. Just as in the earlier estimates, the intercept term is once again significantly positive. This by now widespread finding is often cited as evidence against Friedman's "proportionality hypothesis" that consumption is a constant proportion of permanent income.

Both tables show a relatively high MPC out of labor income and low MPC out of nonlabor income. This is, of course, consistent with the classical notion that workers spend and capitalists save. It is, however, also explained by the HPH. If the expenditure effect is identical out of labor and nonlabor income, then ceteris paribus, the MPC out of labor income will exceed the MPC out of nonlabor income since the first also reflects the operation of the substitution effect. In other words, individuals with higher incomes also have a higher value of time, so they produce commodities according to more goods-intensive production techniques.

Given the high degree of multicollinearity in the data, the MPCs are estimated with surprising precision. Only b_2 in Table 3 fails to be significantly different from zero. All other coefficients are positive with relatively small standard errors. The MPC out of net transfer income is found to lie between the labor and nonlabor MPCs. In the following discussion of short-run MPCs, little attention will be paid to the MPC out of transfer income since it is unclear what the various theories predict for this variable.

Short-run consumption functions were once again estimated with a dummy-variable technique. The following equation was estimated over the five peak to peak cycles:

$$C_t = a + a'd + b_1 Y_{t-1} + b_1' dY_{t-1} + b_2 V_{t-1} + b_2' dV_{t-1} + b_3 T_{t-1} + b_3' dT_{t-1} \quad (12)$$

where d equals 1 over the quarters of a particular business cycle and 0 otherwise. The short-run intercept is obtained as $a + a'$, and the short-run MPCs are obtained as $b_1 + b_1'$, $b_2 + b_2'$, and $b_3 + b_3'$. If a primed coefficient satisfies a standard non-zero significance test, then the computed short-run coefficient is significantly different from the corresponding long-run coefficient. These estimates appear in Tables 3 and 4 for the two definitions of consumption.

Recall that support can be found for the HPH if the short-run MPC out of labor income is significantly smaller than the long-run labor MPC and if the short-run MPC out of nonlabor income is not significantly different from the long-run nonlabor MPC. The data would tend to support the PIH if just the reverse is found. Based upon the evidence in Tables 3 and 4, the estimates consistently favor the HPH over the PIH. Although statistical significance is somewhat lacking, the labor income MPCs are consistently less in the short-run than the long-run. Only the final period in Table 4 fails to make this finding unanimous. Furthermore, the MPC out of nonlabor income is never significantly different in the short-run than the long-run. The short-run nonlabor MPCs are highly variable, but consistently higher than the long-run estimate. Unfortunately, the standard errors on the short-run nonlabor MPCs are rather large, so the evidence is far from definitive.

V. Conclusions

This paper has examined the stability of the long-run coefficients of the consumption function over the five post-war business cycles. Modern theories of consumption including the PIH and LCH predict that the MPC out of disposable income will be smaller when it is estimated with short-run data than when it is estimated with long-run data. When short-run is defined as a single business cycle and long-run as the entire post-war period, the evidence provides mixed support for the PIH and LCH.

Aggregate implications of the HPH were discussed. The theory predicts that the short-run MPC out of labor income should be less than the long-run labor income MPC, but that the short-run MPC out of non-labor income should not be less than the corresponding long-run MPC. Although statistical significance is somewhat lacking, the evidence tends to support these two hypotheses.

Finally, the evidence in the last section of the paper on MPCs out of different types of income can help explain the failure of several of the short-run MPCs out of disposable income to be less than the long-run MPC. Comparing the results in Table 1 (2) with those in Table 3 (4), whenever the short-run MPC out of disposable income is not significantly less than the long-run MPC, the short-run MPC out of labor income fails to be less than the corresponding long-run MPC. Conversely, whenever the short-run labor income MPC is less than the long-run labor income MPC, the short-run MPC out of disposable income is also less than the long-run MPC out of disposable income.

Footnotes

[1]See Ferber, page 1324.

[2]This point is also made by Mayer and Hall.

[3]The reason for estimating short-run consumption functions with this dummy variable technique is to make use of the structure of the error terms outside the years of a particular business cycle. Equation (2) constrains the rho-value in a Cochran-Orcutt procedure to be the same in both the short and long-run.

[4]Implicit in the theory developed so far is a very important macroeconomic implication. Conventional national income statistics do not measure total consumption (z), but only the component of consumption purchased in the market (c). Shifts in the methods of production over time may result in a distorted picture of total consumption if only this one input is being measured. This appears to be a particularly serious omission in long-run studies of consumer welfare as we have witnessed more and more services being purchased in the market instead of produced at home. A correct measure of the value of total consumption would be:

$$\sum_{i=1}^{N} (P_i X_i + w t_i)$$

There have been several very recent attempts to develop expanded national income accounts that would measure total consumption. See, in particular, Eisner [4].

[5]This is suggested by Evans, page 44.

[6]Taylor also assigns proprietor's income to nonlabor income in his study of MPCs out of different types of income.

References

Ando, Albert and Franco Modigliani, "The 'Life Cycle' Hypothesis of Saving: Aggregate Implications and Tests," American Economic Review, March 1963.

Becker, Gary S., "A Theory of the Allocation of Time," The Economic Journal, 75, 1965.

Drazen, Allan, "Consumption Theory and Secular Aggregate Saving: A Reexamination," Presented at the Econometric Society Meetings, Chicago, August 1978.

Eisner, Robert, "Total Incomes in the United States, 1959 and 1969," Review of Income and Wealth, 1978.

Evans, Michael K., Macroeconomic Activity: Theory, Forecasting, and Control, Harper and Row, New York, 1969.

Ferber, Robert, "Consumer Economics, A Survey," Journal of Economic Literature, December 1973.

Friedman, Milton, A Theory of the Consumption Function, Princeton University Press, 1957.

Hall, Robert, "Stochastic Implications of the Life Cycle - Permanent Income Hypothesis: Theory and Evidence," Journal of Political Economy, December 1978.

Heckman, James, "Life Cycle Consumption and Labor Supply: An Explanation of the Relationship Between Income and Consumption Over the Life Cycle," American Economic Review, March 1974.

Lancaster, Kelvin, "A New Approach to Consumer Theory," Journal of Political Economy, 1966, pp. 132-57.

Mayer, Thomas, Permanent Income, Wealth, and Consumption: A Critique of the Permanent Income Theory, the Life-Cycle Hypothesis, and Related Theories, University of California Press, 1972.

Modigliani, Franco and Richard Brumberg, "Utility Analysis and the Consumption Function: An Interpretation of Cross-Section Data," in K. Kurihara (ed.), Post-Keynesian Economics, New Brunswick, 1954.

Muth, Richard, "Household Production and Consumer Demand Functions," Econometrica, 1966, pp. 699-708.

Taylor, Lester D., "Saving out of Different Types of Income," Brookings Paper on Economic Activity, 1971, pp. 383-408.

U. S. Department of Commerce, Bureau of Economic Analysis, National Income and Product Accounts of the United States, 1929-74.

White, B. B., "Empirical Tests of the Life Cycle Hypothesis," American Economic Review, September 1978.

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ANALYSIS OF THE INTERTEMPORAL VARIATION OF DEALER COSTS FOR BLOCK TRANSACTIONS ON THE NEW YORK STOCK EXCHANGE

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